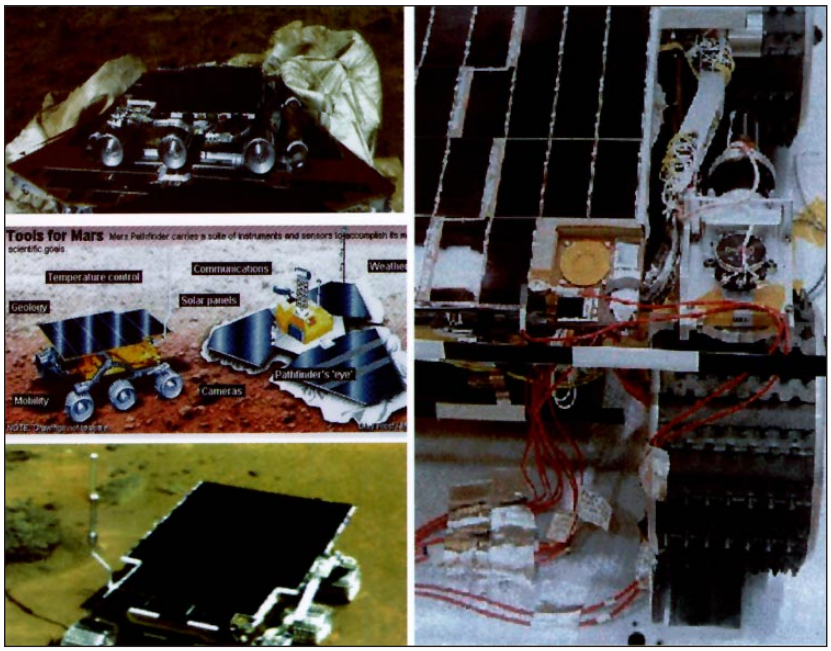
POWER GENERATION RESEARCH ASSISTS PATHFINDER MISSION



Payoff

Solar cells and batteries developed by the Propulsion Directorate provided the rover, called Sojourner, and the lander for NASA's Mars Pathfinder mission with power for their computers, lasers, motors and radio. These superior power generation/storage technologies contributed to the NASA engineers ability to meet the cost goal of the Mars Pathfinder program.

Accomplishment

High efficiency solar cells and non-rechargeable batteries developed by research engineers at the Propulsion Directorate played a role in assisting NASA's Mars Pathfinder mission. The solar cells made of gallium arsenide on germanium (GaAs/Ge) and the lithium-thionyl chloride (Li-SOCl2) batteries powered the Mars rover and the lander carried by the Pathfinder spacecraft.

Background

Unmanned space mission requirements are driven by performance and cost considerations. In most cases, electrical power generation, management and storage functions account for a majority of the spacecraft volume and mass, which translates directly to a significant launch cost driver. In addition, the useful lifetime of a satellite is limited by the power system components immunity to the sometimes harsh radiation and thermal environment experienced in space. As a result of these mission drivers, Directorate researchers pursued photovoltaic power generation and energy storage technology advancements which could improve conversion efficiency, energy density and environmental survivability, thus extending mission lifetimes and reducing power system volume and mass. GaAs/Ge solar cells were conceived and initiated as a research effort in 1984 and Li-SOCl2 non-rechargeable batteries have been researched since the mid 70's. In the Mars Pathfinder mission scenario, it was the high-efficiency and lightweight character of the solar cells which enabled NASA engineers to use 30 percent less cell area to power the rover and lander compared to conventional silicon solar cell technology. The batteries powered the rover during the Martian night and periods of low intensity solar irradiation. The Li-SOCl2 batteries have been demonstrated to possess superior immunity to self discharge, translating to improved longevity and reliability and are robust at extremely low temperatures (well below -100°F).